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## DIGITAL COMPETITIVENESS OF ECONOMICALLY DEVELOPED COUNTRIES: CURRENT SPECIFICS AND DEVELOPMENT PROSPECTS

## ЦИФРОВА КОНКУРЕНТОСПРОМОЖНІСТЬ ЕКОНОМІЧНО РОЗВИНЕНИХ КРАЇН СВІТУ: СУЧАСНІ ОСОБЛИВОСТІ ТА ПЕРСПЕКТИВИ РОЗВИТКУ

**Sholom Alina**

PhD in Economics, associate professor,  
Associate Professor of the Department of International Economic Relations and Logistics,  
V.N. Karazin Kharkiv National University  
ORCID: <https://orcid.org/0000-0002-8471-5753>

**Shynkarenko Oleksii**

Student,  
V.N. Karazin Kharkiv National University  
ORCID: <https://orcid.org/0000-0002-2922-8004>

**Шолом Аліна Сергіївна, Шинкаренко Олексій Сергійович**

Харківський національний університет імені В.Н. Каразіна

The article presents an in-depth analysis of Ukraine's international trade in services, focusing on European and global trends. It explores the current state of Ukraine's service exports and imports, assessing its role and potential in the global market. Particular attention is paid to the structure and dynamics of trade flows. The study highlights the impact of globalization, the growing importance of IT services, and the sector's recovery after the COVID-19 crisis. It outlines key development areas such as technological and intellectual services, social services, logistics, education, and tourism. Despite war-related challenges, Ukraine still has prospects in freight transportation, computer services, international railway, courier and maritime services. The article offers strategic insights into institutional support, investment needs, and future directions for the advancement of Ukraine's external trade in services.

**Keywords:** service sector, international trade in services, Ukraine's external trade, service market, digital competitiveness.

У статті здійснено комплексне дослідження сучасного стану та перспектив розвитку міжнародної торгівлі послугами України в умовах європейських і глобальних трансформацій. Проаналізовано основні тенденції динаміки експорту й імпорту послуг, виявлено зміни у структурі зовнішньої торгівлі, що стали наслідком впливу пандемії COVID-19, прискореної цифровізації, глобалізаційних процесів, посилення інтеграційної взаємодії України з країнами ЄС і переорієнтації торговельних потоків. Акцентовано увагу на підвищенні ролі сфери послуг у зростанні експортного потенціалу національної економіки та зміцненні її конкурентоспроможності на світовому ринку. Особливу увагу приділено інформаційним технологіям, зокрема IT-послугам, які стали драйвером зростання та виявили стійкість до кризових явищ. Виокремлено перспективні напрями міжнародного обміну – технологічні, інтелектуальні, інжинірингові, транспортно-логістичні, освітні, ділові, соціальні та туристичні послуги. Підкреслено важливість розвитку логістичної інфраструктури, цифрових каналів обміну, мультимодальних транспортних сервісів, удосконалення інституційного середовища, підвищення якості регулювання й освіти у сфері цифрової економіки. Встановлено, що впровадження цифрових технологій, суттєво впливає на підвищення ефективності сектору послуг, стимулює експортну активність та формує нові конкурентні переваги. У роботі також висвітлено ризики, пов'язані зі збройною агресією РФ, геополітичною нестабільністю, втратою частини ринків та інфраструктурних можливостей. Аргументовано необхідність цільової державної підтримки галузей із високою доданою вартістю та експортною орієнтацією, зокрема вантажних автоперевезень, IT-сектору, міжнародних залізничних, морських, кур'єрських та поштових послуг. Запропоновано стратегічні напрями торговельної політики для забезпечення сталого зростання зовнішньої торгівлі послугами України, враховуючи виклики післявоєнної відбудови, збереження людського капіталу, цифрову трансформацію та залучення інвестицій у сервісну економіку.

**Ключові слова:** сфера послуг, міжнародна торгівля послугами, зовнішня торгівля послугами України, ринок послуг, цифрова конкурентоспроможність.

**Problem statement.** In today's globalized world, digitalization has become a determining factor in economic development, shaping new business models and stimulating innovation. Economically developed countries are actively using digital technologies to increase productivity, reduce costs, and secure competitive advantages in the international arena. In the digital economy, artificial intelligence, big data, blockchain, and cybersecurity technologies have a significant impact, contributing to the transformation of traditional industries and the creation of new sectors.

For Ukraine, digital transformation opens up opportunities to integrate into global markets, attract investment, and strengthen its position in the global economy. The experience of economically developed countries is an important benchmark for shaping a national digital strategy, overcoming structural challenges, and ensuring sustainable economic growth. Studying the current features of digital competitiveness allows us to identify key success factors, develop effective tools for implementing digital initiatives, and determine the prospects for development in the digital age.

**Analysis of recent research and publications.** The study of digital competitiveness is rapidly evolving, focusing on how digital innovations affect productivity, employment, and competitiveness. However, due to the fast pace of digital change, their economic impact often needs further clarification. Emerging areas such as artificial intelligence, cybersecurity, and automation remain insufficiently explored, raising questions about the digital economy's long-term outlook.

Ukrainian scholars contributing to this field include O. Kononenko, who studies digital economic transformation; V. Melnyk, focusing on digital entrepreneurship and innovation; and O. Shevchenko, who researches financial service digitalization. T. Prokopenko examines IoT in industry, while S. Doroshenko analyzes digitalization's role in innovation policy. Among international researchers, E. Brynjolfsson studies digital technologies and productivity, D. Acemoglu focuses on the economic effects of automation, and S. Zuboff explores technology's social impacts. M. Castells, D. Tapscott, and J. Sachs also provide key insights into the global digital economy.

**The purpose of the article** is to analyze the current features of digital competitiveness of economically developed countries and to assess

the prospects for its development to ensure sustainable economic growth.

**Summary of the main research material.** Digitalization is one of the key processes that encompasses the integration of digital technologies into various aspects of the economy, society and governance. It involves the transformation of traditional processes and operations into a digital format, which allows not only to automate but also to fundamentally change the structure of business and communications. This process involves the use of technologies such as artificial intelligence, Internet of Things (IoT), blockchain, and cybersecurity, which ensure fast data exchange and improve decision-making efficiency.

The main task of digitalization is not only to replace manual labor with machines, but also to change the very nature of processes. It consists of several key stages:

- Digitalization, or the transition from analog to digital data. This is the first step when data and documents are converted into digital format.
- Digital transformation, which includes the restructuring of processes to take into account the new capabilities of digital technologies.
- Automation as part of digital transformation, when individual processes become completely independent of human intervention.

The main areas most affected by digitalization include the financial sector, retail, and industry (Table 1).

Digitalization is reshaping the financial sector through online banking, mobile apps, and fintech, streamlining payments, lending, and insurance while enhancing transaction speed and customer service. In retail, digital tools support e-commerce, analyze consumer behavior, and improve inventory systems, allowing businesses to better meet market demands. Industry benefits from automation, big data, and smart factories that increase operational efficiency. In developed countries, digitalization is advanced due to innovative technologies and digital ecosystems, as illustrated in Figure 1, serving as a foundation for productivity and global competitiveness.

Figure 1. Scheme of technology interaction in the digital ecosystem

*Source: compiled by the authors based on [3; 4; 5]*

The countries ranked in the top 10 in terms of digital competitiveness are mostly developed

Table 1

**The main areas most affected by digitalization**

Scope	The impact of digitalization	Examples of implementation
Financial sector	1. Introduce online banking and mobile applications for convenient and fast financial transactions.	PayPal – digital payment services for instant transactions. Revolut – mobile banking for contactless payments and currency transactions.
	2. Automation of lending and insurance processes using algorithms for risk assessment and quick decision-making.	Lemonade – automated insurance through mobile applications. Ant Financial – platforms for automated lending.
Retail trade	1. Introduce e-commerce to provide convenient online shopping.	Amazon is a leader in online sales with automated warehouses and order processing. Alibaba is an online trading platform.
	2. Use big data analytics to predict consumer preferences and optimize inventory.	Zara – big data integration for inventory management and demand forecasting. Target – analytics for monitoring consumer demand.
	3. Improving customer service through digital platforms and chats that allow you to respond quickly to customer questions.	Nike – a mobile application with personalized recommendations. Sephora – virtual consultants for choosing cosmetics.
Industry	1. Automation of production processes with the help of robotics and artificial intelligence, which reduces costs and increases productivity.	Tesla – automation of car assembly through robotic lines. Siemens – implementation of robotics in factories.
	2. Use of big data to optimize operations and reduce costs at the production and supply stages.	General Electric – data analysis to improve equipment efficiency. Caterpillar – using big data to maintain equipment.

*Source: compiled by the authors based on [1; 2]*

countries with high levels of Internet access, developed ICT infrastructure, and strong innovation potential. For example, Singapore, Sweden, Denmark, South Korea, and Switzerland are leading in many indices, which reflects their highly developed digital ecosystems and ability to adapt to global digitalization.

Global innovation centers are located in economically advanced countries with strong innovation systems, such as the US, UK, Germany, Switzerland, Japan, and South Korea. Each focuses on key technologies aligned with national priorities: the US on AI and biotech, the UK on fintech and blockchain, Germany on industrial IoT, Switzerland on finance and AI research, and Japan and South Korea on mobile tech, 5G, and robotics. These hubs drive global digital progress and strengthen national competitiveness [2; 9].

Let us consider the economic factors of the development of digital competitiveness

of developed countries. We have selected 8 indicators:

1. GDP per capita;
2. High-tech exports (% of industrial exports);
3. Exports of ICT goods (% of total exports of goods);
4. Consumption of renewable energy;
5. Number of people using the Internet;
6. Total unemployment (% of the total labor force);
7. Exports of commercial services (in current USD billion);
8. Unemployment with higher education (% of the total labor force with higher education).

To understand the relationship and the level of this relationship, we conducted a correlation analysis between these indicators (Table 3).

The correlations indicate that digital competitiveness is strongly influenced by high-tech exports, renewable energy use,

Table 2

## Leading countries in terms of digital competitiveness

	Digital Evolution Index	IMD	DiGiX	DESI (EU)	Innovation index	ICT development index	Network readiness index
1	Norway	Singapore	Luxembourg	United Kingdom	South Korea	Iceland	Singapore
2	Sweden	Sweden	United Kingdom	Denmark	Sweden	Korea	Finland
3	Switzerland	USA	Hong Kong	Sweden	Singapore	Switzerland	Sweden
4	Denmark	Finland	USA	Netherlands	Germany	Denmark	Norway
5	Finland	Denmark	Netherlands	Belgium	Japan	Hong Kong	Netherlands
6	Singapore	Netherlands	Singapore	United Kingdom	Finland	Netherlands	Switzerland
7	South Korea	Hong Kong	Singapore	Ireland	United Kingdom	Finland	Sweden
8	United Kingdom	Canada	Norway	Ireland	Israel	Denmark	United Kingdom
9	Hong Kong	Switzerland	Ireland	Romania	France	Luxembourg	Japan
10	USA	Israel	Bulgaria	Israel	Spain	United Kingdom	Japan

Source: compiled by the authors based on [6; 7; 8]

Table 3

## Correlation matrix of 8 economic indicators of digital competitiveness of developed countries

	1.	2.	3.	4.	5.	6.	7.	8.
1.								
2.	0,710							
3.	0,346	0,821						
4.	0,771	0,875	0,800					
5.	0,751	0,925	0,822	0,979				
6.	-0,671	-0,897	-0,701	-0,838	-0,924			
7.	0,918	0,820	0,475	0,854	0,871	-0,8626		
8.	-0,726	-0,900	-0,667	-0,830	-0,916	0,992	-0,889	

\*Violet - very high positive correlation, green - high positive, yellow - medium positive, burgundy - weak positive; blue - very high inverse negative correlation, light green - high inverse, pink - medium inverse, brown - weak inverse.

Source: compiled by the authors based on data from [10–17]

and education. Higher GDP per capita and better Internet access typically align with lower unemployment, especially among highly educated populations. An analysis of 42 developed countries from 2013 to 2023 reveals that most countries experienced positive structural changes in high-tech exports. Countries such as Hong Kong, Ireland, and

Israel saw the greatest positive shifts, while Japan showed minor negative changes [13].

Regarding unemployment among the highly educated, many countries showed no significant change over the decade. Some countries, including the Czech Republic, Ireland, and China, are above average in positive dynamics, while others, such as the UK, Netherlands, and

France, are below average. The highest positive changes were recorded in Croatia, Cyprus, Greece, Portugal, and Spain. Conversely, Puerto Rico, Taiwan Province, and Macau experienced sharp negative shifts [17].

The analysis of the Global Innovation Index for the period 2011–2023 reveals key economic indicators that shape the digital competitiveness of developed countries. These include institutional quality, human capital development, infrastructure, market and business sophistication, innovation output, and creativity. Particular attention is given to the role of ICT access and usage, government online services, and e-participation, which directly reflect the maturity of the digital environment. Electricity generation per capita and employment in knowledge-intensive industries are also important, as they support the technological and innovation capacity of a country.

It is important to further understand the interdependence between all 14 indicators. The correlation analysis takes the average of the numerical scores of all 37 countries for each year and for each of the 14 indicators. In Table 4, numbers 1 through 14 correspond

to the following indicators: 1 – institutions, 2 – human capital and research, 3 – infrastructure, 4 – degree of market development, 5 – degree of business development, 6 – innovation, 7 – creativity, 8 – access to ICT, 9 – use of ICT, 10 – government online services, 11 – e-participation, 12 – electricity production (kWh/person), 13 – knowledge workers, 14 – employment in knowledge-intensive industries in %.

Correlation analysis showed strong positive links between institutions and market development, infrastructure and ICT use, ICT access and employment in knowledge-intensive industries. Other high correlations include ICT use with e-government services and e-participation with employment. Moderate correlations were found between human capital and institutions, market development and electricity production. Weak correlations were identified between institutions and innovation, and human capital and knowledge workers. Negative correlations appeared between market development and knowledge employment, ICT use and knowledge workers, as well as between institutions and innovation, ICT access, and business development [18–30].

Table 4

**Correlation matrix of the 14 studied indicators in the context of the main factors of promoting digital competitiveness of economically developed countries**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1														
2	0,035													
3	-0,240	-0,504												
4	0,827	-0,121	-0,219											
5	-0,495	0,280	-0,143	-0,653										
6	-0,532	0,146	0,029	-0,353	0,424									
7	0,215	0,093	-0,018	0,565	-0,468	0,058								
8	-0,633	-0,535	0,675	-0,620	-0,006	0,020	-0,372							
9	-0,448	-0,636	0,801	-0,429	0,012	-0,105	-0,372	0,866						
10	-0,257	-0,660	0,810	-0,164	-0,095	-0,050	-0,325	0,664	0,859					
11	-0,130	-0,626	0,749	-0,322	0,018	-0,351	-0,520	0,710	0,879	0,809				
12	0,413	-0,113	-0,436	0,419	0,108	-0,036	0,160	-0,445	-0,475	-0,376	-0,304			
13	0,013	0,697	-0,655	-0,009	0,528	0,505	0,060	-0,672	-0,778	-0,648	-0,763	0,379		
14	-0,647	-0,420	0,497	-0,755	0,343	-0,072	-0,620	0,879	0,848	0,595	0,770	-0,359	-0,532	

A direct positive correlation is marked in dark blue, a high positive correlation is identified as dark green, an average direct positive correlation is marked in yellow, and a weak positive correlation is marked in dark red. The inverse correlation was marked as follows: a very negative correlation is marked in blue, an average inverse correlation is marked in a lawsuit color, and a weak inverse negative correlation is marked in light brown.

Source: Developed by the authors based on data from [18–30]



From 2011 to 2023, most developed countries faced negative trends in institutions, human capital, and business development, though infrastructure stayed relatively stable.

Key priorities for enhancing digital competitiveness in developed countries include digital public services, quantum infrastructure, and cybersecurity. Education is evolving through virtual tools, while blockchain, big data, and robotics are reshaping economic processes. In Ukraine, digital progress focuses on IT education, platforms like "Diia," and internet access. Yet, strengthening cybersecurity, investing in R&D, and digitalizing sectors like energy and agriculture remain essential for long-term competitiveness.

**Conclusions.** The current state of international trade in services, particularly in Europe, indicates a certain slowdown. Digitalization is a major force in transforming economies, business models, and innovation worldwide. Countries leading in digital competitiveness possess advanced digital ecosystems, strong ICT accessibility, and innovation potential, which enable effective integration of digital tools in finance, trade, and production, with widespread use of automation, data analytics, and AI.

Correlation analysis highlights a strong link between digital competitiveness and indicators

such as GDP per capita, high-tech exports, internet coverage, education, and renewable energy use. A negative correlation with unemployment among educated populations points to digitalization's role in reducing structural unemployment. From 2013 to 2023, Israel, Ireland, and Hong Kong showed outstanding growth in high-tech exports and innovation, reflecting digital maturity as captured by Global Innovation Index data.

However, some countries experience challenges in areas like human capital, institutional performance, and business environments, stressing the need to revise digital strategies and boost investment in research and innovation. Ukraine's position in the global service market remains vulnerable due to wartime and post-war recovery. Yet, initiatives such as the Diia platform, IT education, and wider internet access signal digital momentum. Key challenges include strengthening cybersecurity, digitizing strategic sectors, and supporting human potential.

Therefore, digital competitiveness should be built on comprehensive technology integration, modernized infrastructure, innovative education, and targeted government support. These measures will help countries not only adapt to global digital change but also shape its trajectory.

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